

# Improvements for Existing Light Commercial Buildings –

## *California Building Energy Efficiency Standards Revisions for July 2003 Adoption*

### Improvements for Existing Light Commercial Buildings

Title 24 currently addresses new construction and additions, missing the opportunity to impact the building renovation and component replacement markets. This effort will explore the feasibility of requiring duct efficiency improvements at the time of HVAC equipment replacement and window efficiency requirements at the time of replacement.

#### Benefits

The market that would be affected by this proposal is potentially enormous, as it could encompass much of the HVAC replacement and window markets in California. Focusing on duct sealing only, 2.7 million furnaces/heat-pumps and 2.7 million air conditioners are replaced nationwide each year, representing almost two thirds of the units shipped each year. Thus, assuming that all air conditioners and furnaces are replaced under permit, that California represents 10% of the national market, and that all air conditioner and furnace replacements are performed simultaneously, then 270,000 duct systems would be sealed each year in California. Using a 15% HVAC energy savings for duct sealing yields an estimated annual energy savings increase of  $1.6 \times 10^{12}$  BTU/year, or approximately \$16M of additional annual savings for each year the that proposed change is in effect. This measure should also provide significant peak-demand benefits, particularly in light commercial buildings, where systems tend to be more oversized compared to residential, and where air-conditioning is generally under continuous control by a thermostat. Turning to windows, approximately 50% of the windows sold each year in California are replacement windows, which means that the savings associated with bringing those windows up to the same efficiency levels specified for new construction would be reasonably equivalent to changing the new-construction window efficiency requirement from single-pane up to the current standards. This assumes that the homes receiving replacement windows were all built prior to the introduction of 2-pane windows via the Title-24 new-construction standards.

#### Environmental Impact

No significant environmental impacts identified.

#### Type of Change

The Energy Commission needs to recognize that it already has considerable leeway to address replacement products via manufactured product requirements (Sections 110-119) and via mandatory measures (Section 150). Some replacement products already have requirements under these sections. For example, air conditioners with the refrigerant charge and airflow criteria added during the AB970 process. Other products do not. An example is replacement windows.

The Energy Commission would need an expanded legislative mandate to address these markets more comprehensively. Presently, there is proposed legislation (SBX2 37, Brulte) working its way through the legislative process. The summary of the bill includes the following language:

“This bill would require the commission to investigate options and develop a plan to decrease wasteful peak load energy consumption in existing residential and nonresidential buildings. The bill would require the commission to report its findings, on or before January 1, 2002, to the Legislature.”

This effort will produce complete standards change proposals that takes into account enforcement and alternative packages to retrofit duct sealing (e.g. duct insulation or roof-deck insulation) and alternative packages to high efficiency windows. Some issues that will need to be addressed include: a) buildings for which duct sealing and duct insulation are both not practical options, b) minimum leakage levels before sealing, and maximum leakage levels after sealing, and c) enforcement criteria, including self certification requirements, third-party testing requirements, and code-enforcement requirements. On the windows side, some issues that will need to be addressed include: a) the variability of window efficiency requirements with respect to climate zone, b) how to handle buildings for which high-efficiency windows are not a practical option (e.g., buildings with cost-prohibitive architectural or structural issues), and c) the practicality of allowing the use of other efficiency improvement measures in lieu of high-efficiency windows (e.g., duct sealing, duct insulation, ceiling insulation, wall insulation).

### Measure Availability and Cost

Cost and availability issues for all of the measures under consideration have been addressed in large part through new-construction code changes, however back-up data for extending to the existing-building market will need to be assembled. The key hurdles with respect to the proposed changes will be on the market/enforcement side. In addition to the enforcement issue, there will be some key market-specific questions that will need to be addressed. For example, many HVAC contractors do not take out permits when replacing HVAC equipment, which makes it difficult even find out that a given piece of equipment has been replaced. Another market implementation issue that will need to be addressed is how to handle exceptions, such as windows in historical buildings.

### Useful Life, Persistence and Maintenance

The persistence of the measures that we envision will be comparable to the persistence of measures currently applied in new construction.

### Performance Verification

For replacement markets, the performance verification of the envisioned changes should not be significantly different than that for the new construction applications. The technical problems that must be addressed for the topic to be adopted by Title 24 will be mostly on the enforcement side. The enforcement side of the equation will need to be explored on a case by case basis. For example, duct sealing at HVAC equipment replacement could be tracked in the same manner as in new construction, or it could require a higher degree of self-certification. On the other hand, replacement windows or duct insulation levels could be treated more like appliances that need to meet minimum efficiency standards.

### Cost Effectiveness

The economic issues associated with the envisioned changes would be similar to those associated with appliance efficiency standards, weighing the first cost against the life-cycle costs of various options. Our first take on this opportunity is that the measures we propose will be good investments for the consumer that produce significant energy and peak demand savings, the magnitude of which we expect to be larger than the savings currently achieved by the current Title-24 Standards. We expect that per-unit savings will be calculable using current analysis tools for Title-24 compliance.

### Analysis Tools

No special analysis tools are required.

#### Relationship to Other Measures

This measure would be affected by other pending changes to the window U-factor and SHGC values and the duct insulation and sealing requirements. It would be beneficial if the replacement requirements paralleled the new construction prescriptive requirements.

#### Bibliography and Other Research

W. W. Delp, N. Matson, D. J. Dickerhoff, D. Wang, R. C. Diamond, M. P. Modera "Field Investigation of Duct System Performance in California Light Commercial Buildings", *ASHRAE Trans.* 104(II) 1998, June 1998.

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